

New species of *Lopescladius* (*Cordiella*) Coffman *et* Roback (Chironomidae: Orthocladiinae) from Brazil

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Abstract

Three new species of *Lopescladius* (*Cordiella*) Coffman *et* Roback, 1984, *L. (C.) morosus*, *L. (C.) vibrissatus* and *L. (C.) uncatus*, from Brazil are described and figured as male imago. An emended generic diagnosis as well as a key to the males are given.

Key words: Chironomidae, Orthocladiinae, *Lopescladius*, *Cordiella*, new species, key, Neotropical region

Introduction

The genus *Lopescladius* was described by Oliveira (1967) based on *L. minutissimus* Oliveira, 1967 from the Amazon in Brazil. The genus is easily recognized on its small size; small, protruding, pubescent to hairy eyes and cordiform fourth tarsomere. Two subgenera are recognized, *Lopescladius s. str.* with 4 species distributed in North, Central and South America and *Cordiella* Coffman *et* Roback, 1984 based on *L. (C.) hyporheicus* Coffman *et* Roback, 1984 from western Pennsylvania in U.S.A. The males of the two subgenera can easily be separated as the gonocoxite in *Lopescladius s. str.* is strongly elongated posteriorly and the inferior volsella is small and spiniform or absent. In *Cordiella* the gonocoxite is not elongated and the inferior volsella is broadly digitiform. The immature stages of *Lopescladius* are probably all psammophilic, living in sandy bedded streams and rivers. The genus appears to be species rich in the Neotropical region (see e.g. Stur 2000; Wiedenbrug 2000).

Below we describe and figure the males of three new species of the subgenus *Cordiella*, all from Brazil. An emended generic diagnosis for the males is given and a key is provided.

Material and methods

The general terminology follows Sæther (1980). The specimens were mounted on slides in Canada balsam following the procedure outlined by Sæther (1969). The measurements are given as ranges, followed by the mean when more than three specimens were measured, followed by the number of specimens measured (n) in parenthesis. The color is described based on cleared, slide-mounted specimens.

The types are deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil; Instituto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil and in the Department of Natural History (ZMBN), Bergen Museum, University of Bergen, Norway.

***Lopescladius* Oliveira**

Unknown gen. *et spec.* near *Corynoneura* Roback (1953: 113; 1957: 56).

"*Cordites*" Brundin (1966: 428), *nomen nudum* (I.C.Z.N. 1999: Article 13.3).

Lopescladius Oliveira, 1967: 417.

Lopescladius Oliveira; Sæther (1983: 280); Cranston *et al.* (1983: 157); Coffman *et al.* (1986: 160); Cranston *et al.* (1989: 176); Sæther (2004: 194).

Cordiella Coffman *et* Roback, 1984: 130, as subgenus.

Type species: *Lopescladius minutissimus* Oliveira, 1967, by original designation and monotypy.

Generic diagnoses for males and females are given by Cranston *et al.* (1989) and Sæther (2004), for pupae by Coffman *et al.* (1986) and for larvae by Cranston *et al.* (1983).

***Lopescladius* subgenus *Cordiella* Coffman *et* Roback**

Type species. *Lopescladius* (*Cordiella*) *hyporheicus* Coffman *et* Roback, 1984: 131, by original designation and monotypy.

Diagnostic characters (males). Small species, wing length 0.7–1.2 mm. Eye small, rounded, strongly protruding, placed low on head; with microtrichia as long as or slightly longer than length of ommatidium. Squama bare. All legs with single tibial spur, with lateral denticles; tarsomere 4 strongly cordiform. Abdominal tergites and sternites with few setae. Tergite IX with rounded, lateral protrusions with 1–2 strong and 3–4 weaker setae; anal point absent. Sternapodeme straight, with strong oral projections. Virga absent. Inferior volsella single or double, with long, broadly digitiform posterior branch, with or without apical hook. Gonostylus broadly rounded, lobe-like, without crista dorsalis and megaseta.

Description (males). Small species, wing length 0.7–1.2 mm.

Antenna. With 13 flagellomeres; groove beginning at flagellomere 3; sensilla chaetica on flagellomeres 2–4 and terminal. AR 0.30–0.55.

Head. Eye small, without dorsomedial extension, strongly protruding, placed low on head; with microtrichia as long as or slightly longer than length of ommatidium. Temporal setae 1(?)–9, weak; in single, irregular line posterior on head. Third palpomere with 1 sensillum medially to subapically.

Thorax. Antep pronotum reduced, lobes narrowly separated; with 1–2 lateral setae. Acrostichals absent, dorsocentrals and prealars few, supraalars absent. Scutellum with few setae, uniserial.

Wing. Membrane without setae, with fine punctuation. VR 1.10–1.60. Costa barely extended; with short, false costal extension. R_{2+3} weak, running and ending close to R_{4+5} . R_{4+5} ending proximal to end of M_{3+4} , distal to end of Cu_1 ; FCu far distal to RM; Cu_1 straight to weakly curved; postcubitus ending distal to FCu; An ending proximal to FCu. Brachiolium with 1 seta, other veins bare. Squama bare.

Legs. Tarsi short, giving comparatively high BV and SV. Pseudospurs and sensilla chaetica absent. Pulvilli apparently absent. All legs with single tibial spur, with lateral denticles and strongly cordiform fourth tarsomere. Comb of hind leg with 9–12 setae.

Abdomen. Tergites II–VIII with single or few strong median setae and without or with 1–2 weaker lateral setae; sternites II–VIII without or with single or few strong median setae.

Hypopygium. Tergite IX with rounded, lateral protrusions each with 1–2 strong and 3–4 weaker setae; posterior margin broadly rounded to bluntly triangular; anal point absent. Laterosternite IX without setae. Phallapodeme well developed, aedeagal lobe apparently weak or absent. Sternapodeme straight, with large oral projections. Virga absent. Gonocoxite with single or double inferior volsella; anterior branch, when present, short, nail-shaped, bare; posterior branch long, broadly digitiform, with or without hooked apex, bare or with few, weak dorsal microtrichia medially. Gonostylus broadly rounded, lobe-like, with microtrichia and few weak setae, without crista dorsalis and megaseta.

Remarks. We have not studied the type material of *L. (C.) hyporheicus* Coffman *et* Roback, 1984, and the generic description is based on the original description and figures (Coffman & Roback 1984) in addition to the new species described below.

***Lopescladius (Cordiella) morosus* sp. n.**
(Figs 1–11)

Type material. Holotype male, **BRAZIL: Pará**, Rurópolis, Rio Tambor, 29.x.2007, Pennsylvania trap, N. Hamada *et al.* (INPA). Paratypes, 5 males, as holotype. 6 males, **Pará**, Rurópolis, Cachoeira do Grin, 04°05'S, 55°00'W, 24.vi.2007, Pennsylvania trap, N. Hamada *et al.* (INPA, ZMBN, MZUSP).

Diagnostic characters. The species is pale brown, has a wing length of about 0.78 mm, antennal ratio of 0.49 and the main branch of the superior volsella is gently curved and projecting anteromedially.

Etymology. From Latin *morosus*, gloomy, referring to the facial expression of the species.

Description (male, $n = 8-11$, except where otherwise stated). Total length 1.63–1.93, 1.80 mm. Wing length 746–838, 782 μm . Total length / wing length 2.13–2.46, 2.32. Wing length / length of profemur 2.46–3.27, 2.90.

Coloration. Head pale yellowish, thorax and abdomen pale brown, legs pale yellowish.

Head (Fig. 1). Antenna with 13 flagellomeres, ultimate flagellomere 137–169, 153 μm long. AR 0.43–0.54, 0.49. Temporal setae 5–9, 7, weak; in single irregular line posterior on head. Clypeus with 2–4, 2 setae. Tentorium, stipes and cibarial pump as in Figure 2. Tentorium 89–111, 102 μm long; 7–9, 8 μm wide. Stipes 64–93, 82 μm long; 5–10, 7 μm wide. Palpomere lengths / widths (in μm): 12–14, 13 / 17–18, 17; 14–19, 17 / 14–16, 15; 25–33, 28 / 14–17, 15; 34–45, 40 / 11–14, 12; 50–65, 55 / 9–14, 10. Third palpomere with 1 sensillum medially to subapically; 6–16, 11 μm long.

Thorax (Fig. 3). Antepronotals 1–2, 1; dorsocentrals 2–4, 3; prealars 1–2, 2. Scutellum with 2 setae.

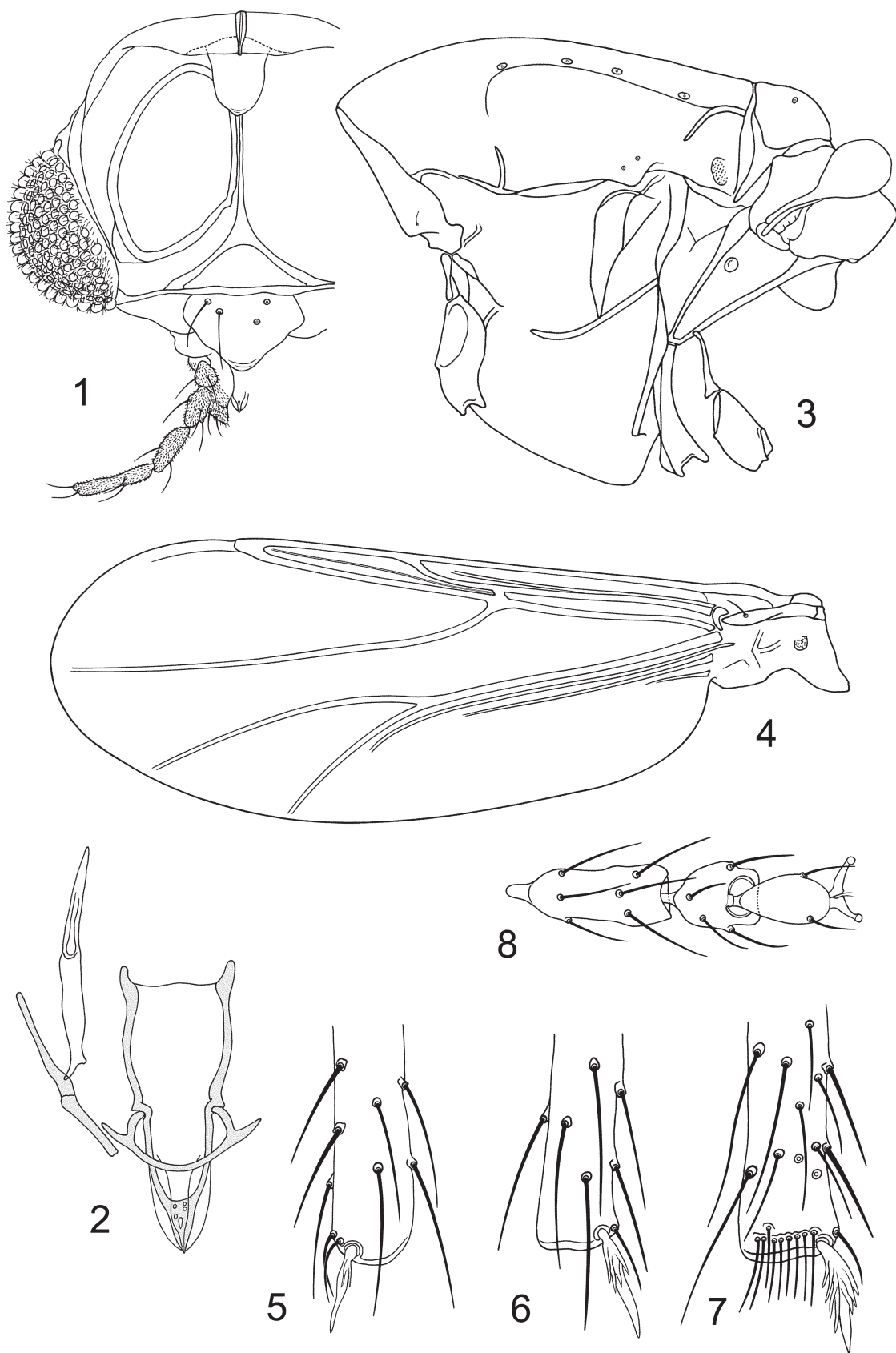
Wing (Fig. 4). VR 1.17–1.48, 1.33. Costal extension 5–22, 15 μm long; false costal extension 71–143, 119 μm long. Brachiolum with 1 seta, other veins bare. Squama bare.

Legs. Spur of fore tibia 26–30, 28 μm long (Fig. 5). Mid tibia with 1 spur, 25–30, 28 μm long (Fig. 6). Hind tibia with 1 spur, 32–36, 34 μm long and comb of 9–12, 11 setae; shortest seta 5–9, 7 μm long; longest 11–16, 15 μm long (Fig. 7). Width at apex of fore and mid tibia 22–25, 23 μm ; of hind tibia 25–29, 27 μm . Tarsomere four of all legs cordiform (Fig. 8). Lengths and proportions of legs as in Table 1.

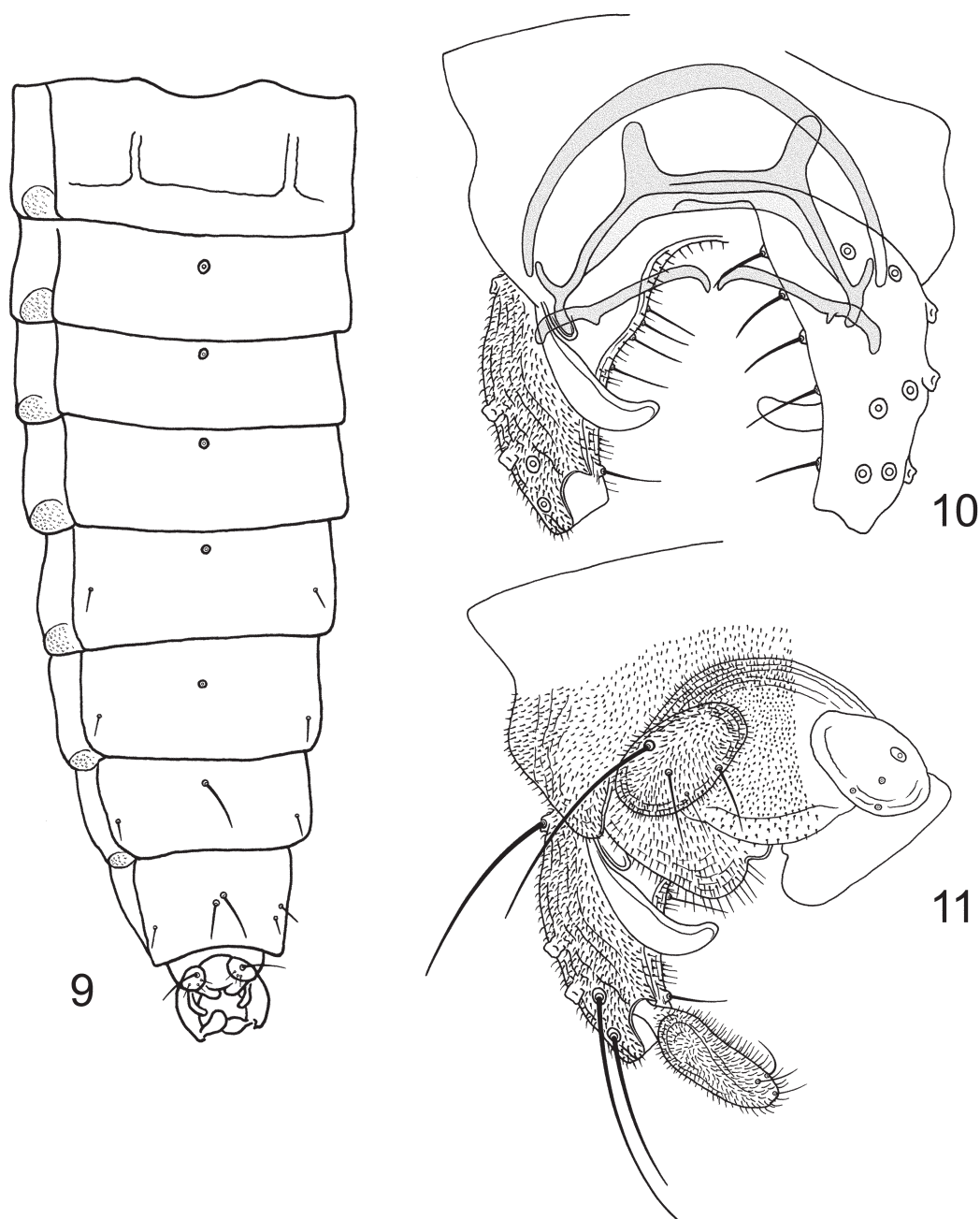
TABLE 1. Length (in μm) and proportions of legs of *Lopescladius (Cordiella) morosus* sp. n., male ($n = 8-11$, except when otherwise stated).

	fe	ti	ta ₁	ta ₂
p ₁	227–344, 271	295–396, 335	79–104, 92	34–58, 44
p ₂	216–263, 237	284–342, 307	79–112, 98	34–58, 46
p ₃	232–259, 248 (5)	293–349, 322	34–43, 38	34–43, 38
	ta ₃	ta ₄	ta ₅	LR
p ₁	22–38, 29	9–13, 12	25–32, 29	0.23–0.35, 0.27
p ₂	23–38, 31	7–13, 10	23–30, 27	0.23–0.44, 0.33
p ₃	23–31, 28	7–11, 9	25–31, 28	0.24–0.27, 0.26
	BV	SV	BR	
p ₁	4.83–7.98, 6.60	5.00–7.95, 6.89	1.4–2.7, 2.2	
p ₂	4.84–6.03, 5.21	5.06–5.46, 5.31	1.4–2.8, 2.0	
p ₃	5.84–6.60, 6.32 (4)	6.67–7.17, 6.93 (4)	1.9–3.0, 2.2	

Abdomen (Fig. 9). Tergite I without setae; tergites II–IV with 1 strong median seta and 0–1, 0 weaker lateral seta on each side; tergites V–VI with 1 strong median seta and 0–1, 1 weaker lateral seta on each side; tergite VII with 1 strong median seta and 1 weaker lateral seta on each side; tergite VIII with 1–2, 1 strong median seta and 1–2, 1 weaker lateral seta on each side. Sternite I without seta; sternites II–III with 0–1, 0 strong median seta; sternite IV with 0–2, 1 strong median seta; sternites V–VI with 1–2, 1 strong median seta; sternite VII with 1–3, 2 strong median setae, sternite VIII with 2–3, 2 strong median setae.



FIGURES 1–8. *Lopescladius (Cordiella) morosus* sp. n., male. 1—head; 2—tentorium, stipes and cibarial pump; 3—thorax; 4—wing; 5—apex of fore tibia; 6—apex of mid tibia; 7—apex of hind tibia; 8—tarsi 3–5 of fore leg.



FIGURES 9–11. *Lopscladius (Cordiella) morosus* **sp. n.**, male. **9**—abdomen, dorsal aspect; **10**—hypopygium with tergite IX removed, dorsal aspect to the left and ventral aspect to the right; **11**—hypopygium, dorsal aspect.

Hypopygium (Figs 10–11). Tergite IX with rounded lateral protrusions, each with 4–5 setae (1–2 strong and 3–4 weaker); posterior margin broadly rounded. Phallapodeme 36–43, 39 μm long; transverse sternapodeme 25–42, 34 μm long. Gonocoxite 81–91, 85 μm long. Superior volsella double; anterior branch nail-shaped; 15–19, 17 μm long; 4–6, 5 μm wide medially; posterior branch digitiform, curved; 35–42, 38 μm long; 7–11, 9 μm wide medially. Gonostylus 37–43, 39 μm long. HR 2.07–2.22, 2.15. HV 4.33–5.69, 5.23.

Remarks. *L. (C.) morosus* **sp. n.** is a small, pale brown species. It can be separated from *L. (C.) hyporheicus* Coffman *et* Roback by having a wing length of 0.75–0.84 mm, while *L. (C.) hyporheicus* has a wing length of 1.07–1.10 mm and by having a nail-shaped anterior branch of the inferior volsella, while this branch apparently is lacking in *L. (C.) hyporheicus*. It can be separated from *L. (C.) vibrissatus* **sp. n.** on the pale brown color and the much smaller size; *L. (C.) vibrissatus* **sp. n.** is much darker and has a wing length of

1.20–1.22 mm. It groups with *L. (C.) uncatus* **sp. n.** on its pale brown color and small size, but the two species can easily be separated as the posterior branch of the superior volsella is gently curved and projecting anteromedially, while this volsella is hooked apically and projecting orally in *L. (C.) uncatus* **sp. n.**

Female, pupa and larva. Unknown.

Distribution and biology. The specimens were taken in Pennsylvania traps situated close to large streams in the Amazon forest in Pará State in northern Brazil.

***Lopescladius (Cordiella) vibrissatus* sp. n.**

(Figs 12–16)

Type material. Holotype male, **BRAZIL: Santa Catarina:** Urubici, Morro da Igreja, cloud forest, 1822 m a.s.l., 18.ix.–05.xii.2004, Malaise trap, L.C. Pinho & L.E.M. Bizzo (MZUSP). Paratypes, 2 males, as holotype (ZMBN, MZUSP).

Diagnostic characters. The species is fully brown, has a wing length of about 1.20 mm, antennal ratio of 0.51 and the posterior branch of the superior volsella is digitiform, curved and projecting anteromedially.

Etymology. From Latin *vibrissa*, whisker, using the suffix *-atus*, provided with, referring to the strong lateral setae on tergite IX.

Description (male, $n = 2-3$). Total length 1.98–2.06 mm. Wing length 1.20–1.22 mm. Total length / wing length 1.63–1.72. Wing length / length of profemur 2.83–2.97.

Coloration. Head brown, thorax dark brown, abdomen and legs brown.

Head. Antenna with 13 flagellomeres, ultimate flagellomere 194–198 μm long. AR 0.50–0.52. Temporal setae 7, weak; in single, irregular line posterior on head. Clypeus with 2–4 setae. Tentorium, stipes and cibarial pump as in Figure 12. Tentorium 132–134 μm long, 9–10 μm wide. Stipes 77–95 μm long, 7–9 μm wide. Palpomere lengths / widths (in μm): 14–17 / 18–19, 23–25 / 16–18, 37–39 / 18–20, 50–53 / 14–18, 77–86 / 11–12. Third palpomere with 1 sensillum subapically, 15–25 μm long.

Thorax (Fig. 13). Antepronotals 1–2, weak; dorsocentrals 3–4; prealars 2–5. Scutellum with 4 setae.

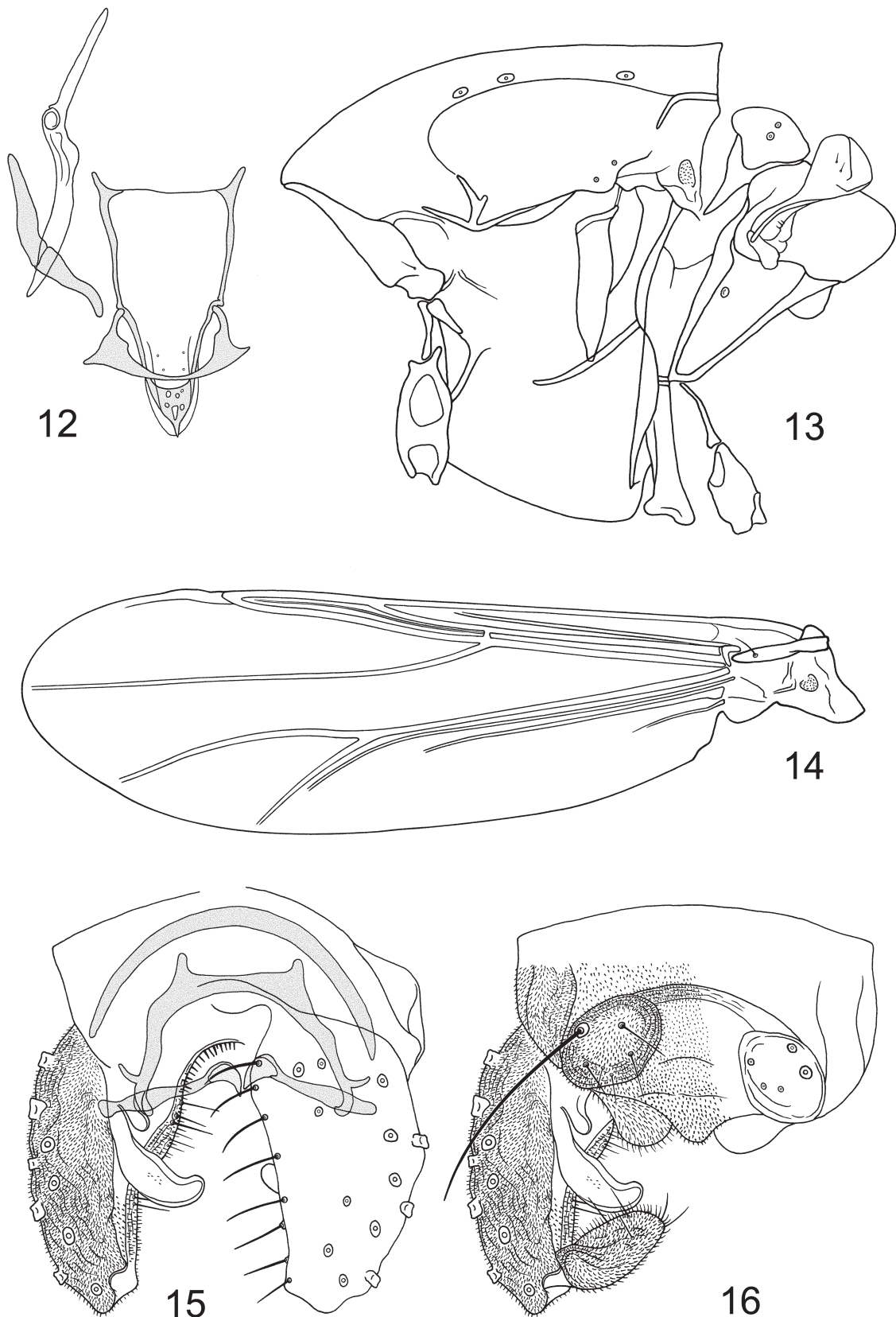
Wing (Fig. 14). VR 1.42–1.56. Costal extension 8–18 μm long; false costal extension 155–182 μm long. Brachiolum with 1 seta, other veins bare. Squama bare.

Legs. Spur of fore tibia 33–37 μm long. Mid tibia with 1 spur, 33–36 μm long. Hind tibia with 1 spur, 41–48 μm long and comb with 12 setae, shortest seta 7–11 μm long, longest 18–23 μm long. Width at apex of fore tibia 29–30 μm , of mid tibia 28–32 μm , of hind tibia 36–39 μm . Lengths and proportions of legs as in Table 2.

Abdomen. Tergite I without seta, tergite II with 1 strong median and 0–1 weaker lateral seta on each side, tergite III with 1 strong median seta, tergite IV with 1 strong median and 0–1 weaker lateral seta on each side, tergites V–VII with 1 strong median and 1–2 weaker lateral setae on each side, tergite VIII with 3 strong median and 1–2 weaker lateral setae on each side. Sternite I without seta, sternite II with 1 strong median seta, sternites III–IV without seta, sternite V with 0–2 strong median seta, sternite VI with 1–2 strong median seta, sternite VII with 3 strong median seta, sternite VIII with 3–4 strong median setae.

TABLE 2. Length (in μm) and proportions of legs of *Lopescladius (Cordiella) vibrissatus* **sp. n.**, male ($n = 3$).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p ₁	403–421	468–500	124–130	56–61	27–31	12–14
p ₂	313–324	380–407	137–155	76–83	43–49	8–12
p ₃	344–360	461–490	126–133	56–58	29–35	11–14
	ta ₅	LR	BV	SV	BR	
p ₁	28–31	0.26–0.27	5.72–7.27	6.88–7.21	2.3–2.9	
p ₂	15–21	0.36–0.38	4.78–4.86	4.67–5.07	1.9–2.9	
p ₃	32–36	0.27–0.29	6.45–6.54	6.13–6.39	3.0–4.4	



FIGURES 12–16. *Lopescladius (Cordiella) vibrissatus* sp. n., male. 12—tentorium, stipes and cibarial pump; 13—thorax; 14—wing; 15—hypopygium with tergite IX removed, dorsal aspect to the left and ventral aspect to the right; 16—hypopygium, dorsal aspect.

Hypopygium (Figs 15–16). Tergite IX with rounded lateral protrusions, each with 5–6 setae (1 very strong and 4–5 weaker); posterior margin bluntly triangular. Phallapodeme 43–48 µm long; transverse sternapodeme 40–42 µm long. Gonocoxite 117–122 µm long. Superior volsella double; anterior branch nail-shaped, 14–17 µm long, 7–8 µm wide medially; posterior branch digitiform, curved, 44–50 µm long, 14–15 µm wide medially, apparently with a few microtrichia medially. Gonostylus 51–58 µm long. HR 2.07–2.18. HV 3.97–4.87.

Remarks. *L. (C.) vibrissatus* **sp. n.** is a comparatively large, dark brown species. It groups with *L. (C.) hyporheicus* Coffman *et* Roback by having a wing length > 1 mm, but the two species can easily be separated as the inferior volsella has an anterior branch in *L. (C.) vibrissatus* **sp. n.** while this volsella appears to be simple in *L. (C.) hyporheicus*. It can be separated from *L. (C.) morosus* **sp. n.** on its dark color and by having a wing length of 1.20–1.22 mm compared to 0.75–0.84 mm in *L. (C.) morosus* **sp. n.** It can be separated from *L. (C.) uncatus* **sp. n.** on its dark color, much longer wing (*L. (C.) uncatus* **sp. n.** has a wing length of about 0.71 mm) and by having the posterior branch of the superior volsella gently curved and projecting anteromedially, while this volsella is hooked apically and projecting orally in *L. (C.) uncatus* **sp. n.**

Female, pupa and larva. Unknown.

Distribution and biology. The specimens were collected in a Malaise trap in a fragmented cloud forest belonging to the Mata Atlântica forest at 1.822 m a.s.l. in Santa Catarina State in southern Brazil.

***Lopescladius (Cordiella) uncatus* sp. n.**
(Figs 17–21)

Type material. Holotype male, **BRAZIL: São Paulo**, Estação Biológica Boracéia, Rio Claro, 2nd bridge, 09.xii.2002, light trap, H.F. Mendes & C.G. Froehlich (MZUSP).

Diagnostic characters. The species is pale brown, has a wing length of 0.71 mm, antennal ratio of 0.30 and the posterior branch of the superior volsella is hooked apically and projecting orally.

Etymology. From Latin *uncus*, hook, angle, using the suffix *-atus*, provided with, referring to the apically hooked main branch of the superior volsella.

Description (male, n = 1). Total length 1.37 mm. Wing length 714 µm. Total length / wing length 1.92. Wing length / length of profemur 2.58.

Coloration. Head, thorax and abdomen pale brown, legs pale yellowish.

Head. Antenna with 13 flagellomeres, ultimate flagellomere 97 µm long. AR 0.30. Temporal setae 7, weak; in single, irregular line posterior on head. Clypeus with 4 setae. Tentorium, stipes and cibarial pump as in Figure 17. Tentorium 106 µm long, 18 µm wide. Stipes 73 µm long, 5 µm wide. Palpomere lengths / widths (in µm): 14 / 15, 16 / 13, 30 / 14, 36 / 11, 61 / 7. Third palpomere with 1 sensillum subapically, 11 µm long.

Thorax (Fig. 18). Antepronotal 1, weak; dorsocentrals 2; prealars 2. Scutellum with 2 setae.

Wing (Fig. 19). VR 1.55. Costal extension 8 µm long; false costal extension about 72 µm long. Brachiolum with 1 seta, other veins bare. Squama bare.

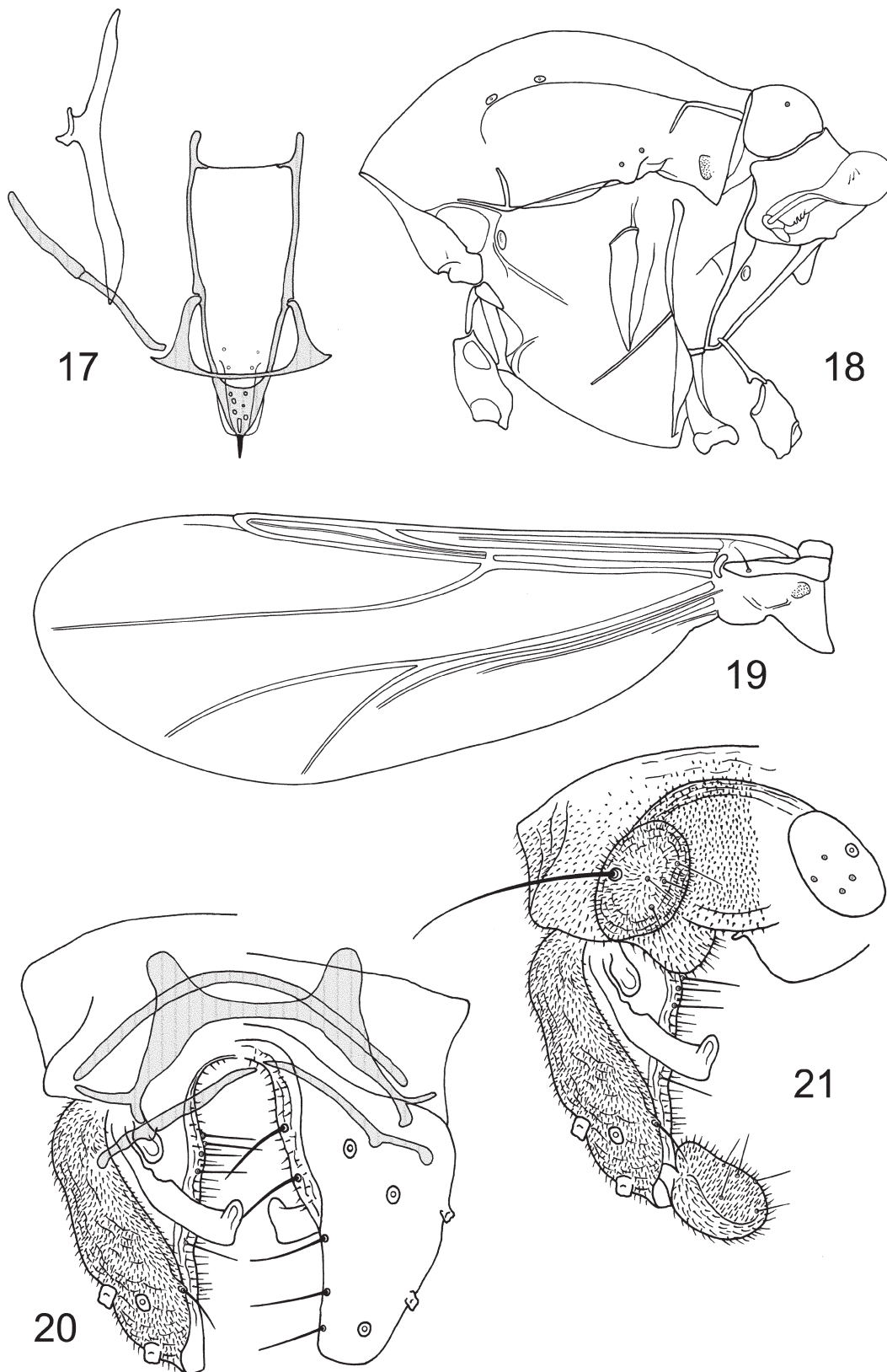
Legs. Spur of fore tibia 20 µm long. Mid tibia with 1 spur, 23 µm long. Hind tibia with 1 spur, 27 µm long and comb of 11 setae, shortest seta 7 µm long, longest 16 µm long. Lengths and proportions of legs as in Table 3.

TABLE 3. Length (in µm) and proportions of legs of *Lopescladius (Cordiella) uncatus* **sp. n.**, male (n = 1).

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	277	297	68	27	15	10	18	0.22	9.13	8.43	–
p ₂	–	–	–	–	–	–	–	–	–	–	–
p ₃	–	299	77	41	18	9	17	0.26	–	–	–

Abdomen. Tergite I without seta, tergites II–IV with 1 strong median seta, tergites V–VII with 1 strong median and 1 weaker lateral setae on each side, tergite VIII with 2 strong median and 1 weaker lateral setae on

each side. Sternite I without seta, sternite II with 1 strong median and 1 weaker lateral setae on each side, sternites III–IV without setae, sternites V–VIII with 1 median seta.



FIGURES 17–21. *Lopescadius (Cordiella) uncatus* sp. n., male. **17**—tentorium, stipes and cibarial pump; **18**—thorax; **19**—wing; **20**—hypopygium with tergite IX removed, dorsal aspect to the left and ventral aspect to the right; **21**—hypopygium, dorsal aspect.

Hypopygium (Figs 20–21). Tergite IX with rounded, lateral protrusions, each with 5 setae (1 very strong and 4 weaker); posterior margin broadly rounded. Phallapodeme 34 µm long; transverse sternapodeme 32 µm long. Gonocoxite 57 µm long. Superior volsella double; anterior branch nail-shaped, 8 µm long, 4 µm wide medially; posterior branch digitiform with apical hook, 33 µm long, 7 µm wide medially. Gonostylus 22 µm long. HR 2.63. HV 6.36.

Remarks. *L. (C.) uncatus* **sp. n.** is a small, pale brown species. It can easily be recognized on the shape of the posterior branch of the superior volsella, which is hooked apically and projecting orally; in the other described species this volsella is gently curved and projecting anteromedially.

Female, pupa and larva. Unknown.

Distribution and biology. The single specimen was collected in a light trap close to a third order stream in a fragmented Mata Atlântica forest in São Paulo State in southeastern Brazil.

Key to the males of *Lopescladius* (*Cordiella*)

1. Gonostylus with posterior elongation; inferior volsella spiniform or absent. *Lopescladius* s. str (not keyed)
- Gonostylus without posterior elongation; inferior volsella single or double, broadly digitiform, with or without apical hook. *Lopescladius* (*Cordiella*) Coffman *et* Roback 2
2. Anterior branch of inferior volsella lacking (Coffman & Roback 1984, fig. 7). Pennsylvania, U.S.A. *L. (C.) hyporheicus* Coffman *et* Roback
- Anterior branch of inferior volsella present 3
3. Posterior branch of superior volsella with apical hook, projecting orally (Figs 20–21). São Paulo State, Brazil *L. (C.) uncatus* **sp. n.**
- Posterior branch of superior volsella gently curved, projecting anteromedially 4
4. Small pale brown species, wing length 0.75–0.83 mm. Pará State, Brazil *L. (C.) morosus* **sp. n.**
- Larger dark brown species, wing length 1.20–1.22 mm. Santa Catarina State, Brazil *L. (C.) vibrissatus* **sp. n.**

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